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Complementary and Alternative Medicine

Focus on Research and Care

in this issue

Complementary and Alternative Medicine: Focus on Research and Care is the newsletter of the National Center for Complementary and Alternative Medicine (NCCAM), a component of the National Institutes of Health, U.S. Department of Health and Human Services.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
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Acupuncture and Pain: Applying Modern Science to an Ancient Practice

Matthew Lester

Adeline Ge, M.D., O.M.D., showing acupoint and meridian on a model

Qi, meridians, yin, yang. How can researchers study acupuncture, a 2,000-year-old form of traditional Chinese medicine (TCM) based on foreign concepts that seem impossible to measure, let alone define?

To Richard Nahin, Ph.D., M.P.H., NCCAM's Senior Advisor for Scientific Coordination and Outreach, the answer is obvious: "We don't necessarily have to understand the concepts of qi or meridians to study the safety or efficacy of acupuncture."

Harvard Medical School neuroscientist (and practicing acupuncturist) Vitaly Napadow, Ph.D., L.Ac., agrees. "I firmly believe that everything can be studied with

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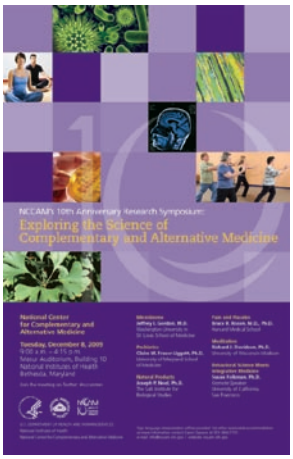
NCCAM's 10th Anniversary Research Symposium: Exploring the Science of CAM



Ten years of rigorous research and advances in the science of complementary and alternative medicine (CAM) were celebrated at NCCAM's 10th Anniversary Research Symposium on December 8, 2009, held in the National Institutes of Health (NIH) Clinical Center's Masur Auditorium in Bethesda, Maryland. Prominent researchers shared exciting findings on a wide range of topics—the body's microbial communities and their role in health and disease, the neuroscience of acupuncture and meditation, and the behavioral science of stress and coping—with an in-person and online audience of approximately 400 health care practitioners, researchers, and members of the public.

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the scientific method. Unfortunately, we don't currently have a 'qi meter.' So, in my research, we don't focus on meridians or qi. We take a neuroscientific approach to study how acupuncture functions through the nervous system."

Using the latest technologies in neuroimaging and genomics, Dr. Napadow and other NCCAM-supported scientists are drawing a scientifically coherent picture of how acupuncture affects the body. They can see physiological effects—changes in the brain's pain centers—with acupuncture. They've observed gene expression and molecular changes in the nervous and immune systems. They hope one day to be able to predict which patients are most likely to benefit from acupuncture.

Scientists aren't ready to claim that acupuncture works for any specific disease—yet. But NCCAM-supported studies have yielded promising evidence that this ancient practice modifies perception of pain and its processing by the brain, and that it may be helpful for pain management. In the years since the 1997 National Institutes of Health consensus statement on acupuncture concluded that more rigorous research was needed, NCCAM has supported a substantial body of research. A number of these studies have tackled the challenge of developing trial designs needed to answer practical clinical questions.

Building an Evidence Base: Clinical Research Progress

"Our goal is to build a house of evidence," explains long-time NCCAM grantee Brian Berman, M.D., director of the Center for Integrative Medicine at the University of Maryland School of Medicine.

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Acupuncture involves stimulating points on the body, using thin, solid, metallic needles that are manipulated by hand or by electrical stimulation. Chinese tradition teaches acupuncture practitioners that the aim is to improve levels of qi, which is considered the energy force behind all life, and restore balance in the opposing forces of yin and yang. The needles are placed along meridians, invisible energy channels described in ancient Chinese manuscripts as running the length of the body.

To date, much of the progress in clinical research on acupuncture has come from an interdisciplinary approach that includes experts in acupuncture, clinical trial methodology, biostatistics, and relevant diseases such as osteoarthritis or carpal tunnel syndrome.

"What we've learned so far is that the most promising area for using

acupuncture is pain," says Dr. Nahin. Clinical studies are showing acupuncture's efficacy for some types of pain, such as back, osteoarthritis, and postoperative pain. For example, a systematic review supports the use of acupuncture for postoperative pain management. An NCCAM-supported Phase III clinical trial led by Dr. Berman showed that acupuncture relieved pain and improved function in patients with knee osteoarthritis when it was used with standard medical care, including anti-inflammatory medications and opioid pain relievers. In a large study published in 2009, researchers found that people suffering from chronic low-back pain who received acupuncture or simulated acupuncture treatments fared better than those receiving only conventional care. Pilot studies have looked at acupuncture in posttraumatic stress disorder and chemotherapy-induced nausea and vomiting. And, the Cochrane Collaboration reviewed 11 randomized trials and found that acupuncture may be a valuable option for patients suffering from tension headaches.

But these clinical outcomes may involve more than acupoints and needles. Other aspects of the acupuncture experience may play important roles in healing, including reassurance provided by the practitioner, expectation of benefit, and the sensory experience elicited by acupuncture needling, which has been called *de qi* and variously described as aching, dull pain, tingling, or a heaviness. In several recent studies researchers have carefully designed their studies to compare true acupuncture to simulated acupuncture and have tried to mimic the sensory experience of true acupuncture so that patients would be unaware of whether they were receiving true or

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From the Director

Science Must Be Neutral

This past year was an exciting one for NCCAM—celebrating our 10th anniversary, reflecting on a decade of achievement, and engaging in a planning process to develop the next strategic vision for our future. The evidence base on both the promise and pitfalls of CAM is growing, and NCCAM has made important contributions in this area. We are bringing rigorous science to the examination of health approaches that have been largely unexamined with scientific methods.

On December 8, 2009, we convened a day-long symposium, "Exploring the Science of Complementary and Alternative Medicine." Our speakers described the most rigorous of scientific studies, often examining interventions and effects that had previously challenged such scrutiny. We heard about research exploring the human microbiome, using cutting-edge science that is creating the next generation of translational tools. Such tools will permit exploration of previously unrecognized mechanisms whereby diet, probiotics, and natural products could influence human health. We learned about studies exploring the effects of meditation and acupuncture on the brain, using creative, innovative research to explore the powers of the mind-body connection and the mysteries of the placebo effect. We heard how behavioral science can bring a new understanding to help deal with the stress of caregiving. (To view a videocast of these lectures, visit www.videocast.nih.gov/summary.asp?File=15484.)

Nevertheless, there are some who still challenge our resolve to fund and conduct unbiased, rigorous studies of CAM modalities. Some of our critics suggest that our objective is to give credibility to unproven claims. Others believe we are only interested in proving that CAM therapies don't work. In fact, our agenda is to bring rigorous science to the broad range of health practices that fall under the umbrella of complementary and alternative medicine; and—particularly for those approaches used widely by the American public—to learn if these modalities are safe and whether they are effective. The science we fund is built on a framework of public use, sound research, and the potential to affect public health practice. At NCCAM, we are unwavering defenders of science and the scientific method, and we approach our work with curiosity and neutrality.

Josephine P. Briggs, M.D.
Director

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simulated acupuncture. In some of these studies, such as the 2009 study on low-back pain, both simulated acupuncture and real acupuncture produced greater benefit than standard therapy.

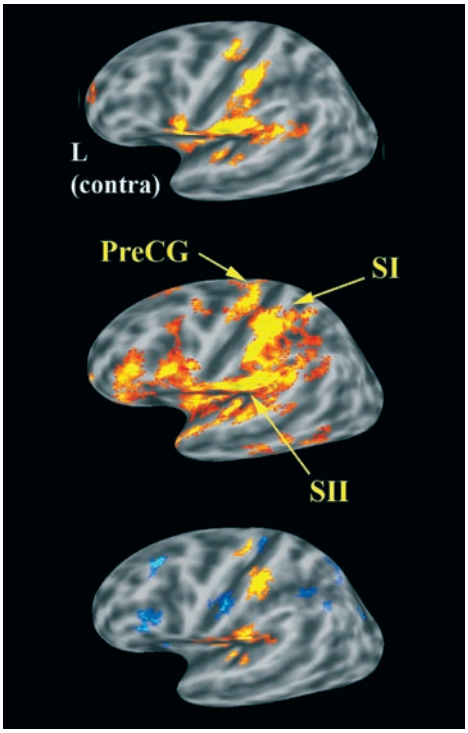
Acupuncture's Effect on the Brain

Fascinating results regarding the possible use of acupuncture are coming out of clinical trials, but what are the mechanisms of action behind these effects? For example, NCCAM-supported researchers are tapping into the power of genomic techniques to look at what is happening at the cellular level and study acupuncture's effect in the expression of genes involved in pain. Researchers are also harnessing cutting-edge technologies to uncover pathways in the brain involved in the body's response to acupuncture.

"We wanted to know if the brain was involved in the process and how it was involved," says Bruce Rosen, M.D., Ph.D., principal investigator of an NCCAM Center of Excellence on Acupuncture and Brain Activity at Harvard Medical School. And the time is right to approach these questions. Powerful imaging techniques—fMRI (functional magnetic resonance imaging), PET (positron emission tomography), and MEG (magnetoencephalography)—are now available to reveal areas of the brain affected during pain and to map the impact of acupuncture in patients experiencing pain.

"With the advent of noninvasive brain imaging we were able to begin looking at human brain response to acupuncture and start to evaluate potential mechanisms in humans," says Dr. Napadow. And they found differences in this brain response between people with chronic pain and healthy controls.

For example, in research on carpal tunnel syndrome, which can cause pain and numbness due to compression of nerves in the wrist, Dr. Napadow and colleagues performed fMRI before and after acupuncture and found that patients with carpal tunnel syndrome responded to acupuncture differently from healthy controls. Their studies, published in 2007, showed that the brain of patients with carpal tunnel syndrome responded to acupuncture needling with greater activation in an area of the brain known as the hypothalamus and deactivation in another area known as the amygdala. These two areas of the brain are involved in behavior, emotions, long-term memory, and maintenance of a persistent pain state.



V. Napadow, Ph.D.; used with permission

The study led by Dr. Napadow examined the effects of acupuncture in patients with carpal tunnel synydrome. In these participants, nonpainful stimulation of finger 3 on the right hand produced hyperactivation in the left primary sensorimotor cortex. After acupuncture, this hyperactivity was reduced.

A number of aspects of the acupuncture experience probably contribute to the neural effects and quite possibly to the clinical benefit. Researchers have learned that the direct effects of acupuncture may be amplified by the expectation of benefit. "We found that expectation itself is a powerful modulator of the brain," says Dr. Rosen. "Expectation seems to be as powerful an influence on reduction in pain as acupuncture needling, though it appears to work in a different network in the brain that may be complementary."

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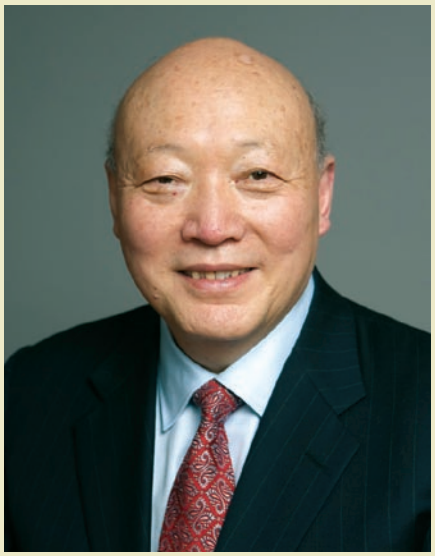
Progress on Pain

NCCAM-supported studies are revealing how and when acupuncture works, such as the neurological effects of stimulation with acupuncture needles and the role expectation can play in pain.

- Patients who are experiencing chronic pain show different brain changes from those of healthy volunteers, an important finding for understanding overall pain processes, as well as acupuncture's effects.
- Acupuncture appears to affect several mechanisms in the brain and spinal cord, including those involved in pain and inflammation.
- Expectation of pain relief plays a role in acupuncture's impact, although it affects an area of the brain that tells the body how to deal with pain, rather than the pain-reducing areas affected by needle stimulation itself.

For more information on acupuncture for pain, see the Perspective column on pg. 5.

An Interview With Xiaoming Tian, L.Ac., C.M.D.



Xiaoming Tian, L.Ac., C.M.D.

Xiaoming Tian, L.Ac., C.M.D., has been director of the Academy of Acupuncture and Chinese Medicine and the Wildwood Acupuncture Center, in Bethesda, Maryland, since 1986. He is also an adjunct assistant professor of preventive medicine at the Uniformed Services University of the Health Sciences, which provides training to military physicians, nurses, and educators. Dr. Tian is a member of the National Advisory Council for Complementary and Alternative Medicine. He has conducted research projects, with NIH grant support, on acupuncture, Chinese herbal medicine, and dietary supplements. Dr. Tian was appointed as the first clinical consultant on acupuncture at the NIH Clinical Center (1991) and served as a member on the White House Commission on Complementary and Alternative Medicine Policy (2001-2002).

Dr. Tian received his medical degree from Beijing Medical University in China. He completed postdoctoral fellowships in bone pathology at the Johns Hopkins University School of Medicine and in biochemistry and ultrastructure at the National Institute on Aging and the National Institute of Dental and Craniofacial Research. He obtained the certificate of Doctor of Chinese Medicine issued by the World Federation of Chinese Medicine Societies.

> "In my experience, acupuncture can be used for a number of symptoms and conditions, most often as a complementary therapy."
>
> — Dr. Xiaoming Tian

What are the most common symptoms and conditions that you treat in your acupuncture clinic?

We treat over 80 symptoms and conditions in our clinic. From most to least common, the top 12 are

1. Chronic and acute pain
2. Osteoarthritis
3. Fibromyalgia
4. Sports injuries
5. Sciatica and neuralgia
6. Automobile-accident injuries
7. Autoimmune diseases
8. Allergies and asthma
9. Depression, anxiety, and stress
10. Bell's palsy and paralysis
11. Skin rashes and eczema
12. Side effects of chemotherapy and radiation therapy for cancer.

Most of our patients seek acupuncture treatment for pain and pain-related conditions. In my experience, acupuncture can be used for a number of symptoms and conditions, most often as a complementary therapy. For example, I have found acupuncture to be very useful to cancer patients, primarily for symptom management, but also to enhance immune function through increasing lymphocyte and natural killer cell activity. In arthritis, I have often found acupuncture beneficial as well—for joint pain, swelling, stiffness, and joint function, such as range of motion. I find that it is best used in the early stages of disease.

In some cases, we have used acupuncture as an alternative therapy—for example, in sciatica. Many of our patients come to acupuncture as a last hope, after limited progress with other therapies.

How does acupuncture help people who have chronic pain?

In traditional Chinese medicine theory, pain is described as the stagnation of qi, or vital energy, in the meridian system. Acupuncture is intended to enhance the free flow of qi and remove obstructions in the meridian in order to reduce pain. In Western medicine, several scientific theories have been advanced to explain the effects of acupuncture in treating pain and inflammation, such as the gate theory, the endorphin theory, and the adrenocortotrophic hormone (ACTH) hypothesis.

In addition to pain management, patients in our practice may experience other benefits from acupuncture—such as increased energy, better mood, improved sleep quality, and feeling less stressed. Our clinic takes a holistic, comprehensive approach that includes recommendations on keeping a healthy diet and exercising regularly. We also recommend the practice of qi gong or tai chi, with a goal of balancing the mind and body. Many of our patients continue with acupuncture on a maintenance basis.

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Next-Generation Studies

While researchers continue to tackle the challenges in conducting acupuncture studies, such as differences between Western and TCM diagnostic approaches, acupuncture's focus on individualized care, and finding the best possible simulated or placebo procedure, they are also working toward the next generation of studies.

"We want definitive information for health care providers and the public on when acupuncture should be used and for whom, and what types and course of therapy will show efficacy," says NCCAM's Dr. Nahin. "We want to know the most appropriate dose, how many treatments per week, and what needle points are effective so acupuncturists can use evidence-based medicine to give the best care to their patients."

Researchers would also like to know if adjuvant acupuncture could enable reduction in doses of pain medications, with fewer adverse effects of the medication.

Finally, having a test to know who would benefit from acupuncture would be a move toward personalized medicine. Researchers are using imaging studies and genomic studies to search for biomarkers to predict who would be good candidates for acupuncture. "Now we can embed brain imaging evaluation within a clinical trial to correlate clinical outcome measures with brain changes," says Dr. Napadow.

"There's something about the specifics of acupuncture that seem to evoke a more dramatic response in certain parts of the brain than other kinds of sensory stimuli," Dr. Rosen says. "It suggests there's something special about acupuncture that's worth trying to understand."

Spanish Resources for Patients and Consumers

Get information on CAM in Spanish:
fact sheets and links to other Spanish resources

nccam.nih.gov/health/espanol/

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Get the Facts

Information for Consumers

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Colds and Flu: Can CAM Help?

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No one looks forward to the cold and flu season. Americans catch an estimated 1 billion colds each year. In fact, the common cold is among the leading reasons for visiting a doctor and for missing school or work. The flu, with its potential complications, can be an even greater concern. Each year, an estimated 5 to 20 percent of Americans come down with the flu. Although most recover without incident, flu-related complications result in more than 200,000 hospitalizations and 36,000 deaths annually.

In an effort to prevent or treat these all-too-common illnesses, some people turn to complementary and alternative medicine (CAM) approaches. This fact sheet provides basic information on colds and flu, as well as "what the science says" about some of these CAM approaches. If you are considering using a CAM therapy for colds or flu, this information can help you talk to your health care provider about it.

CAM and the Common Cold

About the Common Cold

The common cold is a viral infection of the upper respiratory system. Many different viruses, including various types of rhinovirus, can cause colds. Children are especially susceptible, in part because their immune systems have not yet developed resistance to cold-causing viruses. Research suggests that stress can lower resistance to colds. Researchers are also looking at possible connections between a number of other factors—environmental and personal—and susceptibility to colds.

People can catch a cold by touching a virus-contaminated surface and then touching their eyes or nose, or by inhaling airborne droplets of infected mucus. Symptoms usually appear 1 to 3 days after exposure and include sneezing, runny or stuffy nose, sore throat, and cough. The average cold lasts a week. Although colds sometimes are mistaken for influenza, the two conditions are caused by different viruses, and only the flu is likely to involve a high fever and extreme fatigue.

The chances of catching a cold can be reduced by washing the hands frequently and avoiding contact with people who have colds. People with colds are advised to rest and drink fluids. Over-the-counter pain or cold medicines can help relieve symptoms. Antibiotics do not fight cold viruses. There is no vaccine to prevent the common cold, and there is no known cure.

CAM Practices People Use for Colds

People try many different CAM therapies in their efforts to fight colds (see box on next page). According to estimates based on the 2007 National Health Interview Survey (NHIS), colds ranked eighth among adults and third among children as a medical condition prompting CAM use.

What the Science Says About CAM and the Common Cold

There is no *conclusive* scientific evidence that any CAM therapy prevents colds or substantially reduces their duration or severity in adults or children. Although some studies suggest possible benefits, overall evidence

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for specific CAM therapies is limited and/or mixed, and many studies have been methodologically flawed. Given the public health burden of the common cold, and the widespread use of some CAM therapies to fight colds, researchers continue to investigate potential CAM options, including the dietary supplements commonly used for colds—echinacea, vitamin C, and zinc.

Many people take **echinacea** supplements to prevent or treat colds. (In the 2007 NHIS, echinacea was the most commonly used natural nonvitamin/nonmineral supplement among children, and the third most commonly used supplement among adults.) These products vary widely, using different echinacea species, plant parts, and preparations. The many clinical trials of echinacea for colds have also varied widely, in terms of products studied, research methodology, and study results. Reviews of the research have found some limited evidence that echinacea may be useful for treating colds in adults. Results are less promising for children and for preventing colds. Three NCCAM-funded trials found no benefit from echinacea for preventing or treating colds. A 2008 evaluation of the research concluded that clinical data on echinacea so far are not conclusive and suggested directions for further research.

Evidence of **vitamin C** for the prevention and treatment of the common cold has been mixed. A 2007 analysis of results from 30 clinical trials involving 11,350 participants found that taking vitamin C regularly (at least 0.2 grams per day) did not reduce the likelihood of getting a cold, but was associated with slight reduction in the duration and severity of cold symptoms. Among participants in six trials who were exposed to extreme physical or cold stress (e.g., soldiers in subarctic conditions) and took vitamin C, a 50-percent reduction in the risk of getting a cold was seen. Analysis of several other trials involving adults who started vitamin C therapy after onset of cold symptoms did not find convincing evidence of an effect on duration or severity of colds. A 2009 review of the research on vitamins and minerals for colds concluded that vitamin C supplementation has shown some potential for treating colds; the review noted, however, that few therapeutic trials have been published (none studying children) and that more research is needed to determine optimal doses and treatment strategies. Vitamin C is generally considered safe; however, side effects have been reported when taken in high doses.

Zinc is present in a number of products sold as natural medicines for colds. In 2009, the U.S. Food and Drug Administration warned consumers to stop using intranasal zinc products (zinc-containing homeopathic cold remedies), because of case reports of nosmia (loss of smell). The effect of zinc on the severity or duration of cold symptoms is inconclusive; some studies find benefits, others do not. In a 2007 review of the research, three of the four studies that met all of the reviewers' quality criteria found no therapeutic effect from zinc lozenges or nasal spray; one study reported positive results for zinc nasal gel. A study reported in 2008 found that zinc acetate lozenges reduced the severity and duration of cold symptoms, compared with placebo. A 2009 review of the research on vitamins and minerals for colds noted that variations in the results of zinc lozenge trials are related mainly to variations in dosage, and that doses of more than 70 mg per day have consistently reduced the duration of colds; the review concluded that zinc has shown potential for treating colds, and that additional research is needed to determine optimal doses and treatment strategies.

Fighting Colds With CAM

Echinacea, vitamin C, and zinc are not the only CAM therapies that people sometimes try in hopes of preventing colds or relieving cold symptoms. Here are some other examples:

- Andrographis *(Andrographis paniculata)*
- Astragalus *(Astragalus membranaceus)*
- Bee propolis
- Chinese herbal medicine
- Elderberry *(Sambucus nigra)*
- Garlic *(Allium sativum)*
- Goldenseal *(Hydrastis canadensis)*
- Green tea
- Guided imagery
- Homeopathic remedies
- Honey
- Hydrotherapy
- Nasal irrigation
- North American ginseng *(Panax quinquefolius)*
- Peppermint *(Mentha x piperita)*
- Probiotics
- Selenium
- South African geranium or Umckaloabo *(Pelargonium sidoides)*
- Stress management
- Vitamin E

Scientific evidence to date does not support recommending any of these therapies for general use against colds. People should check with their health care provider before using any CAM therapy for colds—especially before treating a child.

CAM and the Flu

About the Flu

Influenza (flu) is a contagious respiratory illness caused by influenza viruses. Seasonal flu outbreaks occur annually. Flu viruses are very changeable, and the common strains are different from year to year. Usually these changes are gradual; however, sometimes a new, potent strain (such as 2009's H1N1 virus) emerges suddenly and causes a major flu epidemic, or even a pandemic—i.e., the illness becomes very widespread.

The flu is not the same as the common cold (different viruses are involved), and it is unrelated to what is often called "stomach flu." Like colds, though, the flu spreads easily from person to person through virus-contaminated surfaces or through the air. Symptom onset is likely to be abrupt for the flu, more gradual for colds. Flu symptoms are usually more severe than cold symptoms and are likely to include fever (often high), headache, muscle and joint pain, and extreme fatigue. Young children, older adults, pregnant women, and people with certain chronic health conditions are at increased risk of flu-related complications such as pneumonia.

Vaccination is the best protection against contracting the flu. As with colds, the chances of catching the flu can also be reduced by washing hands frequently and avoiding contact with people who have the flu. If taken within 48 hours of symptom onset, the prescription antiviral drugs oseltamivir (Tamiflu) and zanamivir (Relenza) can reduce the severity and duration of flu symptoms.

CAM Practices People Use for the Flu

Although there are vaccines to prevent the flu, prescription drugs to treat it, and over-the-counter remedies that can help relieve symptoms, people may use CAM approaches—including various natural products and mind-body practices—in hopes of strengthening their resistance to flu viruses and recovering more quickly from bouts of the flu.

What the Science Says About CAM and the Flu

There is no conclusive scientific evidence that any CAM therapy is useful against the flu. Some studies suggest a *potential* role for certain therapies, but the evidence is very limited, and additional research is needed before any of these therapies can be recommended as safe and helpful in preventing or treating the flu. Research is ongoing in areas of CAM that may have relevance for combating the flu.

Examples of **natural products** that some people try in their efforts to combat the flu include elderberry, echinacea, North American ginseng, Chinese medicinal herbs, oscillococcinum, green tea, vitamin D, vitamin C, N-acetylcysteine (NAC), and dehydroepiandrosterone (DHEA). **Mind-body practices** include mindfulness meditation and tai chi.

Protecting Yourself and Your Family Against the Flu

According to the U.S. Food and Drug Administration, there are many unfounded claims for products to prevent or treat the flu. Vaccination is the best protection against contracting the flu. Visit the Web site Flu.gov for comprehensive information on the flu.

NCCAM-Funded Research

NCCAM-supported researchers are conducting a variety of studies relevant to colds and flu. Examples of recent research include:

- Effects of echinacea, placebo, and doctor-patient interactions on the duration and severity of colds
- Biological mechanisms underlying the role of stress in susceptibility to colds
- Selenium supplementation for boosting immunity to colds and flu
- Meditation and exercise for preventing acute respiratory infections in men and women age 50 and older, including effects on antibody response to flu vaccination
- Methods for evaluating the effects of botanicals on the human immune response.

If You Are Considering CAM for Colds or Flu

- Do not use any CAM therapy as a substitute for vaccination against the flu. There is no conclusive scientific evidence that any CAM therapy works to prevent or treat colds or the flu, but evidence is especially limited for the flu.
- Talk to your health care providers. Tell them about the CAM therapy you are considering for preventing or treating colds or flu and ask any questions you may have. They may know about the therapy and be able to advise you on its safety, use, and likely effectiveness.
- If you are considering dietary supplements, keep in mind that they can act in the same way as drugs. They can cause medical problems if not used correctly or if used in large amounts, and some may interact with medications. Your health care provider can advise you. If you are pregnant or nursing a child, or if you are considering giving a child a dietary supplement, it is especially important to consult your health care provider. To learn more, see the NCCAM fact sheet *Using Dietary Supplements Wisely*.

■ Tell all your health care providers about any complementary and alternative practices you use. Give them a full picture of what you do to manage your health. This will help ensure coordinated and safe care. For tips about talking with your health care providers about CAM, see NCCAM's Time to Talk campaign at nccam.nih.gov/timetotalk/.

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NCCAM Director Josephine P. Briggs, M.D., kicked off the celebration by sharing a brief history of the Center, discussing patterns of CAM use by the public, and highlighting examples of the Center's achievements as well as findings from major studies. "We are not defenders of complementary and alternative medicine. We are not debunkers," said Dr. Briggs about NCCAM's mission. "We are scrupulously neutral, but we believe that bringing science to these practices is informative to the public."

The science that Dr. Briggs emphasized was evident in all of the day's presentations, as were the depth and diversity of NCCAM's research interests. The presentations prompted spirited question-and-answer exchanges throughout the symposium.

The morning session focused on probiotics and explored the human body's microbial communities, their composition and function, and how they affect and are affected by their habitat. The speakers were Dr. Jeffrey Gordon and Dr. Claire Fraser-Liggett.

Metagenomics: Human Microbial Communities and Their Influence on Health

Researchers in metagenomics focus on genetic material from entire communities of organisms living in or on a host (i.e., the microbiome), as opposed to focusing on a single species cultivated in a laboratory. This approach and the innovative techniques researchers are developing make it possible to address questions with far-reaching implications for health: How do changes in diet, lifestyle, and environment affect the human microbiome? How does the microbiome contribute to our health and predispose us to disease? Can we manipulate microbial communities (e.g., with probiotics) for the benefit of individuals or particular populations?

Lisa Helfert

Dr. Robert Nussenblatt (left), Acting Director of NCCAM's Division of Intramural Research, moderates as Dr. Claire Fraser-Liggett (middle) and Dr. Jeffrey Gordon (right) answer questions

Jeffrey I. Gordon, M.D., the Dr. Robert J. Glaser Distinguished University Professor and director of the Center for Genome Sciences at the Washington University School of Medicine in St. Louis, described his laboratory's studies of the microbial world within the human gut. In his presentation titled "The Human Gut Microbiome: Dining in with a Few Trillion Fascinating Friends," Dr. Gordon highlighted study findings on how the gut microbial "ecology" might predispose people to obesity or malnutrition. He and his colleagues have successfully introduced human microbiomes into germ-free mice and are using these "humanized" mice as workstations for testing ideas about the mechanisms of human nutrition, health, and disease.

Dr. Gordon noted the importance of a global perspective on the microbiome and suggested establishing "human microbial observatories" to sample microbial communities in the context of different cultures. "The microbiome will be an interesting and new source of diagnostic tests and therapeutics," he observed, "and selective manipulation of the microbiome will be a part of our 21st century pharmacology and a different dimension of personalized medicine."

One international effort already under way, the NIH Human Microbiome Project (HMP), is studying five microbial communities in the human body, including the composition and functions of these communities—"who's there?" and "what are they doing?" **Claire M. Fraser-Liggett, Ph.D.,** professor of medicine and director of the

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Institute for Genome Sciences at the University of Maryland School of Medicine in Baltimore, noted research linking many diseases to changes in microbial communities, leading her to surmise that it is important to consider disease in a more holistic way.

An HMP study in Dr. Fraser-Liggett's laboratory is looking at the microbiome of the human oral cavity, comparing samples from 10 healthy individuals and laying the foundation for studies in patients with periodontal disease. Another project is studying the role of gut microbiota in obesity and metabolic syndrome in a group of old-order Amish, a relatively closed population with a fixed gene pool. In another study of Crohn's disease in a group of Swedish twins, patterns are emerging that may help to explain mechanisms of the disease and suggest possible therapeutic approaches.

"Studying the human microbiome is giving us a different view of our biology, physiology, and pathology," Dr. Fraser-Liggett noted. Among questions to be addressed in the future is how to use this emerging information to manipulate the microbiome to promote health and prevent and treat disease.

The afternoon session of the symposium focused on the neuroscience of two mind-body CAM practices—acupuncture and meditation—and on the behavioral science of coping. The speakers were Dr. Bruce Rosen, Dr. Richard Davidson, and Dr. Susan Folkman.

Lisa Helfert

Afternoon session moderator, Dr. Jack Killen (left), NCCAM Deputy Director, and Dr. Bruce Rosen (middle) listen as Dr. Richard Davidson (right) answers a question

A Scientific Look at Acupuncture and Pain, Meditation and Well-Being, and Coping

Research in acupuncture and various mind-body practices such as meditation has yielded promising evidence over the past 10 years. Scientists using the latest technologies to help identify how these practices affect the brain are also yielding important findings on how the brain controls pain and emotions. Acupuncture, for example, is widely used for chronic pain relief, and there is growing evidence that it is helpful and cost effective for some conditions. But scientists have yet to uncover how it works. **Bruce R. Rosen, M.D., Ph.D.,** professor of radiology and health sciences and technology (HST) at Harvard Medical School, Massachusetts General Hospital (MGH), and director of the Nuclear Magnetic Resonance Center at the MGH-HST Athinoula A. Martinos Center for Biomedical Imaging, is studying the mechanisms of acupuncture analgesia. Dr. Rosen and his colleagues are using imaging technologies to study the brain's response to acupuncture. Their findings are revealing interesting connections involving acupuncture, pain, and placebo.

In studies, functional magnetic resonance imaging (fMRI) in healthy subjects shows changes in brain activity patterns during acupuncture; some patterns are similar to those seen with other tactile stimulation (e.g., a toothpick jab), but others are unique to acupuncture. Another study in people suffering from carpal tunnel syndrome found that acupuncture helped, as reported by patients and measured by grip strength. Brain imaging with fMRI showed that acupuncture was associated with a return to normal brain patterns of sensation, an effect sustained for several weeks (see pg. 4).

As Dr. Rosen pointed out, there is more to the story. For example, clinical studies often show that "sham" acupuncture (e.g., performed without piercing the skin) is essentially as effective as real acupuncture in relieving pain, and that both produce greater benefits than conventional treatment alone. Even though end results are similar for real and sham acupuncture, however, the patterns of brain response are different.

"The complexities emerging in acupuncture research are not surprising," observed Dr. Rosen, noting the many facets of the traditional acupuncture experience that may affect how pain is perceived and processed.

A neuroscience approach is also being applied to meditation research, as demonstrated by **Richard J. Davidson, Ph.D.,** William James and Vilas Professor of Psychology and Psychiatry, and director of the Laboratory for Affective Neuroscience at the Waisman Laboratory for Brain Imaging and Behavior, at the University of Wisconsin-Madison. In studies focusing on the voluntary cultivation of compassion, differences in brain patterns are seen when experts in compassion meditation—Buddhist monks with thousands of hours of experience—and novice meditators are exposed to the same emotional sounds, such as a woman screaming. Specific areas of the brain involved have been linked to emotion processing and empathy.

Lisa Helfert

Dr. Susan Folkman delivers symposium keynote lecture

Few can devote thousands of hours to learning meditation, so the question becomes whether short-term training in compassion meditation can make a difference. A recent study, in which subjects engaged in a 2-week Internet training, suggests the answer is yes. Based on the subjects' performance in a "redistribution of wealth" game, as well as the brain's response to visual images, the brief training in compassion meditation was associated with increased altruism.

Other studies have shown that meditation practices appear to be ideal for improving attention; for example, a 3-month meditation training improved subjects' performance on an attentional "blink" test. Meditation has also been shown to improve the body's antibody titer response to flu vaccine and to lessen inflammatory response to laboratory-induced suction blisters.

An important bottom line from the research in Dr. Davidson's laboratory is that positive qualities, such as compassion and attention, appear to be trainable skills. Many challenges and possibilities await researchers in this field.

In her keynote presentation, **Susan Folkman, Ph.D.,** professor of medicine emeritus and founding director of the Osher Center for Integrative Medicine at the University of California, San Francisco, discussed the perspective that behavioral science brings to our understanding of how people respond to stress. As disease becomes increasingly linked to behavioral causes and responses, integrative medicine is a point where behavioral and medical sciences are converging in the interests of improving health and well-being.

Dr. Folkman outlined a theoretical model of stress and coping that she and her colleagues in the field have developed and modified, and the process by which the model was further tested in a study of men caring for partners with HIV/AIDS during the peak of the AIDS epidemic in San Francisco.

The study had a surprising finding: positive emotions existed alongside negative ones in these men, even under the most stressful conditions. The men never lost the ability to enjoy simple pleasures. The meaning underlying these positive emotions is part of a coping mechanism that comes into play when a situation is at its worst. The researchers incorporated the new concept of meaning-based coping into their model and have embarked on a clinical trial to show how their findings can help people cope with stress.

Much research remains to be done to take full advantage of the potential of meaning-based coping. "The research will have to be interdisciplinary," Dr. Folkman noted, "and NCCAM is leading the way."

To Learn More

A videocast of the symposium is available at www.videocast.nih.gov/summary.asp?file=15484.

Lisa Helfert

Symposium attendees in NIH's Masur Auditorium

Research Digest

Iyengar Yoga for Chronic Low-Back Pain Shows Promising Results

© Bob Stockfield

Yoga instructor demonstrates a warrior pose

Low-back pain is a major public health issue in the United States and the main reason why people use CAM. Previous research suggests that yoga, a popular CAM activity, may be beneficial for people with chronic low-back pain; however, many studies have had design flaws. NCCAM-funded researchers at West Virginia University conducted a clinical trial to evaluate the effects of Iyengar yoga* on chronic low-back pain. They were also interested in yoga's effects on depression and use of pain medication.

Of the 90 people with chronic low-back pain who participated in the 24-week trial, 43 were assigned to the yoga group and attended 90-minute Iyengar yoga classes twice a week. The other 47 were assigned to the control group and used standard medical care. (Controls were "wait-listed" and offered the yoga classes after the study was completed.) The participants filled out questionnaires rating their level of pain, functional disability, and depression halfway through the trial (12 weeks), immediately after (24 weeks), and at a 6-month follow-up. Participants were also interviewed about their use of pain medication before, during, and 6 months after the trial. Sixteen people (12 in the yoga group, 4 in the control group) did not complete the trial.

The researchers found that compared with the control group, the yoga group had significantly greater reductions in functional disability, pain, and depression, at weeks 12 and 24 and at the 6-month follow-up. There were no significant differences in pain medication usage between the groups; however, there appeared to be a trend toward decreased usage in the yoga group.

The researchers concluded from their results that yoga decreases functional disability, pain, and depression in people with chronic low-back pain. However, they noted potential limitations of their study (e.g., heavy reliance on self-report instruments, and differential demands on yoga vs. control groups in terms of attention and group support) and suggest design considerations for future research.

Reference

Williams K, Abildso C, Steinberg L, et al. Evaluation of the effectiveness and efficacy of Iyengar yoga therapy on chronic low back pain. *Spine*. 2009;34(19):2066-2076.

* Iyengar yoga is a popular style of yoga that is based on the teachings of B.K.S. Iyengar. It uses props such as blocks, belts, and blankets to help support the body during postures.

Tai Chi May Benefit Older Adults With Knee Osteoarthritis

Knee osteoarthritis (OA) is an increasing problem among older adults, causing pain, functional limitations, and reduced quality of life. The traditional Chinese practice of tai chi, with its combination of physical and mental components, seems promising for OA patients; however, scientific evidence to support its use for this purpose has been limited. To strengthen the evidence base on this topic, NCCAM-funded researchers at Tufts Medical

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Center recently conducted a long-term, randomized, controlled trial comparing tai chi and conventional exercise in a group of 40 adults (mean age 65) with symptomatic knee OA.

The study participants were assigned to a tai chi group or a control group. Both groups attended 60-minute classes twice a week for 12 weeks. The tai chi group learned and practiced Yang-style tai chi, modified slightly to eliminate excess stress on the knees. The control group received wellness education and did stretching

exercises. Participants were also instructed to perform tai chi or stretching exercises between classes, and to continue this at-home activity after the classes were finished. The researchers used several measures to monitor the subjects at 12, 24, and 48 weeks.

Compared with the control group, tai chi patients had greater improvement in measures of pain, physical function, self-efficacy (belief in one's own abilities), depression, and health-related quality of life. Although most differences between the two groups were statistically significant only at 12 weeks, the differences for self-efficacy and depression remained statistically significant at 24 and 48 weeks. No serious adverse events were reported.

The researchers recommend additional studies of biologic mechanisms and approaches of tai chi, so its benefits can be extended to a broader population.

Reference

Wang C, Schmid CH, Hibberd PL, et al. Tai chi is effective in treating knee osteoarthritis: a randomized controlled trial. *Arthritis & Rheumatism*. 2009;61(11):1545-1553.

NCCAM Exhibits at Upcoming National Meetings

Society for Acupuncture Research, March 19-21, Chapel Hill

National Hispanic Medical Association, March 25-28, Washington, D.C.

Society of Behavioral Medicine, April 7-10, Seattle

American Pain Society, May 6-7, Baltimore

New Resources from NCCAM

NCCAM sponsors a Complementary and Integrative Medicine Consult Service lecture series at NIH, which is targeted to NIH Clinical Center staff and also available to the public on the Web (live and archived). Currently a monthly series, its topics address how the integration of CAM treatments can affect approaches into the research and practice of medicine. Recent speakers have included Tracy W. Gaudet, M.D., Duke Center on Integrative Medicine, on "Health Care Today: The Central Challenge," and Kevin W. Chen, Ph.D., M.P.H., Center for Integrative Medicine, University of Maryland School of Medicine, on "Introduction to Medical Qigong." Speakers and links to lectures are at nccam.nih.gov/research/consultservice/lecture.htm.

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How do you work with other health care providers?

I believe that it is important to work with the patient's physicians and other medical professionals in order to provide the best care and service for patients. We do this through open communication, providing progress reports, and making referrals as needed. We find that acupuncture works well in conjunction with conventional treatments—such as surgery, physical therapy, chemotherapy, and radiation—and with chiropractic therapy.

For More Information

Selected References

National Center for Complementary and Alternative Medicine (NCCAM Clearinghouse; see pg. 2)

- *Acupuncture: An Introduction* (nccam.nih.gov/health/acupuncture/introduction.htm)
- *Acupuncture for Pain* (nccam.nih.gov/health/acupuncture/acupuncture-for-pain.htm)
- *Traditional Chinese Medicine: An Introduction* (nccam.nih.gov/health/whatiscam/chinesemed.htm)
- Resources for Health Care Providers (nccam.nih.gov/health/providers/)

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Resources

What's New from Cochrane?

The Cochrane Database of Systematic Reviews is a resource for reliable evidence-based information on medical treatments. Its content is prepared by The Cochrane Collaboration, an international nonprofit organization of health care professionals. Using a systematic process, Cochrane reviewers analyze the results of clinical trials and other published and unpublished sources to explore the evidence for and against the effectiveness and appropriateness of treatments. Each review has an abstract of the key findings, often in plain language for the public. Among the CAM-related topics in Issue 4, 2009, are

New Reviews

- Chinese herbal medicines for people with impaired glucose tolerance or impaired fasting blood glucose
- Probiotics for the treatment of bacterial vaginosis
- S-Adenosylmethionine [SAMe] for osteoarthritis of the knee or hip

Updated Reviews

- Artichoke leaf extract for treating hypercholesterolemia
- Chinese herbal medicines for esophageal cancer
- Chinese medicinal herbs for measles
- Glucosamine for treating osteoarthritis

Abstracts are available free of charge at www.cochrane.org. Full reports are available by paid subscription and pay-per-view from The Cochrane Library and are also in many medical school and hospital libraries. Through a grant to the Center for Integrative Medicine at the University of Maryland, NCCAM helps fund maintenance and expansion of the Cochrane database of studies on CAM.

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